



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

sn

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/715,956	11/17/2003	Michael D. Goodner	42P17286	4445
8791	7590	03/22/2005		
BLAKELY SOKOLOFF TAYLOR & ZAFMAN 12400 WILSHIRE BOULEVARD SEVENTH FLOOR LOS ANGELES, CA 90025-1030			EXAMINER NGUYEN, THANH T	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 03/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/715,956	Applicant(s) GOODNER ET AL.	
	Examiner Thanh T. Nguyen	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Oath/Declaration

Oath/Declaration filed on 11/17/03 has been considered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, 13-15, 23-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Hussein (U.S. Patent No. 6,329,118).

Hussein teaches a method comprising: determining a dry etch rate of a sacrificial, light absorbing material (SLAM) (104) and of an interlayer dielectric (ILD) material (103) (see figure 1);

comparing the dry etch rate of the ILD material with the dry etch rate of the SLAM (see col. 6, lines 13-39);

altering (selectivity) the composition of the SLAM to provide a changed dry etch rate for the SLAM such that the dry etch rate of the altered SLAM is approximately equal to the dry etch rate of the ILD material (see col. 6, lines 12-39).

Regarding to claim 2, altering (dyed) the composition of the SLAM increases its dry etch rate(see col. 6, lines 12-39).

Regarding to claim 3, altering (selectivity) the composition of the SLAM decreases its dry etch rate (see col. 6, lines 30-39).

Regarding to claim 4, 15, 25, the SLAM comprises a polymer-based material (organic, see col. 6, lines 12-39).

Regarding to claim 5, the SLAM comprises a silicon-based material (SOG, see col. 6, lines 12-39).

Regarding to claim 13. A method comprising:

selecting a sacrificial, light absorbing material (SLAM), (104) for use with a dielectric material in a damascene process (see col. 6, lines 13-27);

comparing a dry etch rate (selectivity) of the SLAM with a dry etch rate of the dielectric material when both are etched at the same time (see col. 6, lines 13-27);

determining whether the etch rate (selectivity) of the SLAM needs to be increased or decreased to match the etch rate of the dielectric material (see col. 6, lines 13-27);

altering (selectivity) the composition of the SLAM to increase or decrease its etch rate such that the etch rate (selectivity) of the altered SLAM matches the etch rate of the dielectric material (see col. 6, lines 13-27).

Art Unit: 2813

Regarding to claims 14, 24. The method defined by claim 13, wherein the dielectric material is a carbon doped oxide (see col. 4, lines 50-54).

Regarding to claim 23. A method comprising: altering the composition of a SLAM to provide a changed dry etch rate for the SLAM such that the changed etch rate of the altered SLAM is approximately equal to a dry etch rate of an interlayer dielectric (ILD) Material (see col. 6, lines 13-27);

forming a via opening(107, figure 1c) in a layer fabricated from the ILD material;
filling the via opening with the altered SLAM (104, figure 1d); and
etching a trench approximately centered on the via opening such that the ILD material and the SLAM etch at the same rate (see figure 1f-1g).

Claims 1-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Chae et al. (U.S. Patent Publication No. 2005/0029229).

Chae et al. teaches a method comprising: determining a dry etch rate of a sacrificial, light absorbing material(SLAM) (104) and of an interlayer dielectric (ILD) material (103) (see paragraphs# 23-24);

comparing the dry etch rate of the ILD material with the dry etch rate of the SLAM (see paragraphs# 25);

altering (selectivity/(dyed sog/sop)) the composition of the SLAM to provide a changed dry etch rate for the SLAM such that the dry etch rate of the altered SLAM is approximately equal to the dry etch rate of the ILD material (see paragraphs# 23-25).

Art Unit: 2813

Regarding to claim 2. altering (dyed) the composition of the SLAM increases its dry etch rate(see paragraphs# 23).

Regarding to claim 3, altering the composition of the SLAM decreases its dry etch rate (see paragraph# 23).

Regarding to claim 4, 15, 25, the SLAM comprises a polymer-based material (SOP, see paragraph# 24).

Regarding to claim 5, the SLAM comprises a silicon-based material (SOG, see paragraph# 24).

Regarding to claim 6. the altering of the SLAM comprises the introduction of a halogen into the SLAM (see paragraph# 12).

Regarding to claims 7, 12, 18, the halogen is fluorine (see paragraph# 12).

Regarding to claims 8, 16, the altering of the SLAM altering a carbon-to-silicon ratio in the SLAM (see paragraph# 27).

Regarding to claim 9, 19, the altering of the SLAM comprises introducing carbon in a cyclic, aromatic or cage form into the SLAM (polymer carboxy methyl is an organic chain cyclic paragraph# 24).

Regarding to claim 10, the altering of the SLAM comprises the introduction of a halogen into the SLAM (see paragraph#12).

Regarding to claim 11, the altering of the SLAM comprises introducing carbon in a cyclic, aromatic or cage form into the SLAM (see paragraph# 24, organic polymer).

Regarding to claim 13. A method comprising:

Art Unit: 2813

selecting a sacrificial, light absorbing material (SLAM), (104) for use with a dielectric material in a damascene process (see paragraph# 23-24);

comparing a dry etch rate of the SLAM with a dry etch rate of the dielectric material when both are etched at the same time (see paragraph# 25);

determining whether the etch rate of the SLAM needs to be increased or decreased to match the etch rate of the dielectric material (see paragraph# 25);

altering the composition of the SLAM to increase or decrease its etch rate such that the etch rate (selectivity) of the altered SLAM matches the etch rate of the dielectric material (see paragraph# 23-25).

Regarding to claims 14, 24. The method defined by claim 13, wherein the dielectric material is a carbon doped oxide (103, see paragraph# 23).

Regarding to claim 17, halogen is added to or removed from the SLAM to increase or decrease its etch rate so that it matches the etch rate of the dielectric material so that it matches the etch rate of the dielectric material (see paragraphs# 25, 42).

Regarding to claim 19. carbon in a cyclic, aromatic, or cage form is added to or removed from the SLAM to decrease or increase its etch rate so that it matches the etch rate of the dielectric material (see paragraphs# 23-25).

Regarding to claim 20 the SLAM is a siloxane based material (see paragraph# 20).

Regarding to claim 21, the etch rate of the SLAM is increased or decreased by adding fluorine or removing fluorine from the SLAM to match the SLAM etch rate to that of the dielectric material (see paragraphs# 12, 25, 42).

Regarding to claim 22. carbon in a cyclic, aromatic, or cage form is added to or removed from the SLAM to decrease or increase its etch rate so that it matches the etch rate of the dielectric material (see paragraph# 24-25).

Regarding to claim 23. A method comprising: altering the composition of a SLXM to provide a changed dry etch rate for the SLAM such that the changed etch rate of the altered SLAM is approximately equal to a dry etch rate of an interlayer dielectric (ILD) Material (see paragraphs# 23-24);

forming a via opening(107, figure 1c) in a layer fabricated from the ILD material;
filling the via opening with the altered SLAM (104, figure 1d); and
etching a trench approximately centered on the via opening such that the ILD material and the SLAM etch at the same rate (see figure 1f-1h).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2813

Claims 6-12, 16-22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hussein (U.S. Patent No. 6,329,118) as applied to claim 1-5, 13-15, 23-25 in view of Chae et al. (U.S. Patent Publication No. 2005/0029229).

Hussein teaches a method of patterning a damascene structure by using sacrificial light absorbing material. However, the reference does not teaches altering of the SLAM comprises the introduction of a halogen into the SLAM, the halogen is fluorine the altering of the SLAM altering a carbon-to-silicon ratio in the SLAM, the altering of the SLAM comprises introducing carbon in a cyclic, aromatic or cage form into the SLAM, the altering of the SLAM comprises the introduction of a halogen into the SLAM, halogen is added to or removed from the SLAM to increase or decrease its etch rate so that it matches the etch rate of the dielectric material so that it matches the etch rate of the dielectric material, the SLAM is a siloxane based material, the etch rate of the SLAM is increased or decreased by adding fluorine or removing fluorine from the SLAM to match the SLAM etch rate to that of the dielectric material.

Chae et al. teaches a method of patterning a damascene structure by using sacrificial light absorbing material comprising:

Regarding to claim 6. the altering of the SLAM comprises the introduction of a halogen into the SLAM (see paragraph# 12).

Regarding to claims 7, 12, 18, the halogen is fluorine (see paragraph# 12).

Regarding to claims 8, 16, the altering of the SLAM altering a carbon-to-silicon ratio in the SLAM (see paragraph# 27).

Art Unit: 2813

Regarding to claim 9, 19, the altering of the SLAM comprises introducing carbon in a cyclic, aromatic or cage form into the SLAM (polymer carboxy methyl is an organic chain cyclic paragraph# 24).

Regarding to claim 10, the altering of the SLAM comprises the introduction of a halogen into the SLAM (see paragraph#12).

Regarding to claim 11, the altering of the SLAM comprises introducing carbon in a cyclic, aromatic or cage form into the SLAM (see paragraph# 24, organic polymer).

Regarding to claim 17, halogen is added to or removed from the SLAM to increase or decrease its etch rate so that it matches the etch rate of the dielectric material so that it matches the etch rate of the dielectric material (see paragraphs# 25, 42).

Regarding to claim 19. carbon in a cyclic, aromatic, or cage form is added to or removed from the SLAM to decrease or increase its etch rate so that it matches the etch rate of the dielectric material (see paragraphs# 23-25).

Regarding to claim 20, the SLAM is a siloxane based material (see paragraph# 20).

Regarding to claim 21, the etch rate of the SLAM is increased or decreased by adding fluorine or removing fluorine from the SLAM to match the SLAM etch rate to that of the dielectric material (see paragraphs# 12, 25, 42).

Regarding to claim 22. carbon in a cyclic, aromatic, or cage form is added to or removed from the SLAM to decrease or increase its etch rate so that it matches the etch rate of the dielectric material (see paragraph# 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would patterning a damascene structure by using sacrificial

Art Unit: 2813

light absorbing material to altering of the SLAM comprises the introduction of a halogen into the SLAM, the halogen is fluorine the altering of the SLAM altering a carbon-to-silicon ratio in the SLAM, the altering of the SLAM comprises introducing carbon in a cyclic, aromatic or cage form into the SLAM, the altering of the SLAM comprises the introduction of a halogen into the SLAM, halogen is added to or removed from the SLAM to increase or decrease its etch rate so that it matches the etch rate of the dielectric material so that it matches the etch rate of the dielectric material, the SLAM is a siloxane based material, the etch rate of the SLAM is increased or decreased by adding fluorine or removing fluorine from the SLAM to match the SLAM etch rate to that of the dielectric material in process of Hussein et al. as taught by Chae et al. because the process would eliminate defect and capability to control the etching feature profile.

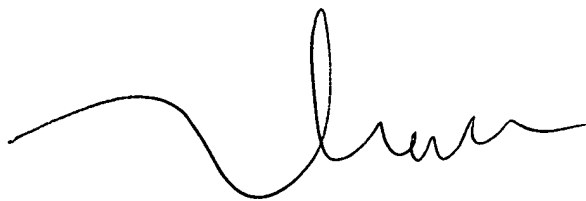
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See **MPEP 203.08**).

Art Unit: 2813

A handwritten signature in black ink, appearing to read 'Thanh Nguyen', with a stylized, flowing script.

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN